GEOMETRY.

Conducted by B. F. FINKEL, Springfield, Mo. All contributions to this department should be sent to him.

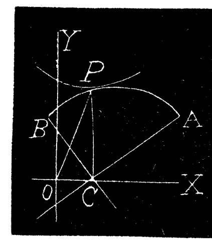
SOLUTIONS OF PROBLEMS.

52. Proposed by F. P. MATZ, M. Sc., Ph. D., Professor of Mathematics and Astronomy in Irving College, Mechanicsburg, Pennsylvania.

If the *center* of a rolling ellipse *move in a horizontal line*, determine the surface on which the ellipse rolls.

Solution by G. B. M. ZERR, A. M., Ph. D., Professor of Mathematics and Applied Science, Texarkana College, Texarkana, Arkansas-Texas.

Let BPA be a quadrant of the ellipse semi-axes AC, and BC, O the position of the center when BC coincides with OY, and $\angle BCP=\theta$. Then



$$PC=y=\frac{ab}{\sqrt{a^2\cos^2\theta+b^2\sin^2\theta}}=\frac{b}{\sqrt{1-e^2\sin^2\theta}}.$$

$\therefore$ The ellipse rolls on the inner surface of the cylinder

$$y^2+z^2=\frac{b^2}{1-e^2\sin^2\theta}.$$

When $e=0$, this becomes $y^2+z^2=b^2$.

To find the abscissa of the point of contact, we have, since arc $PB=$ arc PG,

$$ds=\sqrt{r^2d\theta^2+dr^2}=\sqrt{y^2d\theta^2+dy^2} \text{ since } PC=r=y;$$

$$\text{also } ds=\sqrt{dx^2+dy^2}.$$

$$\therefore \sqrt{dx^2+dy^2}=\sqrt{y^2d\theta^2+dy^2}.$$

$$\therefore dx=yd\theta, \text{ or } x=\int yd\theta=\int\frac{bd\theta}{\sqrt{1-e^2\sin^2\theta}}=b\mathbf{F}(e,\ \theta).$$

When $e=0$, $x=b\theta$.

[No other solution of this problem was received. EDITOR.]

53. Proposed by B. F. FINKEL, A. M., Professor of Mathematics and Physics in Drury College, Springfield, Missouri.

A pole, a certain length of whose top is painted white, is standing on the side of a hill. A person at A observes that the white part of the pole subtends an angle equal to α